way, so that the financial position can be readily understood. A pupil who has been taught arithmetic in a reasonable way can adapt his knowledge to the forms of bookkeeping in a few weeks when placed in an office. For people who have not had the advantage of a rational education, it is necessary to draw up hard and fast rules, which must be obeyed in order to keep accounts intelligibly. The volume under notice does this, by showing as simply as possible how a trader unfamiliar with bookkeeping may construct, keep and balance a set of account books suited to his own business. A set of "Automatic Balancing Charts" is published separately as a supplement to the book, and they are drawn up in such a way that it is almost impossible for a person of average intelligence to make an incorrect entry upon them. Both the book and the charts should prove of service to business men unfamiliar with the intricacies of bookkeeping.

Reports from the Laboratory of the Royal College of Physicians, Edinburgh. Edited by Sir Batty Tuke, M.D., and D. Noel Paton, M.D. Vol. vii. (Edinburgh: Oliver and Boyd, 1900.)

THIS volume consists of a series of original papers which, since the end of 1897, have emanated from the laboratory of the Royal College of Physicians of Edinburgh. Practically all these papers have been published previously in the medical or scientific journals, and in this form have no doubt been read by those interested in their subject-matter. This is, however, perhaps only partially true of two reports which were presented respectively to the Fishery Board for Scotland and to the Prison Commission for Scotland. The first report consists of sixteen monographs on the life-history and the physiology, under varying conditions, of the salmon; and concludes with a monograph, by Dr. Dunlop, upon the food value of the salmon at different seasons, and obtained from different sources.

Dr. Dunlop is also the author of a report to the Prison Commission for Scotland upon prision dietaries. The report seems to be an exhaustive one, and contains many suggestions with regard to the adaptation of the diets in prisons to the varying conditions and labour employments of the prisoners.

Mother, Baby and Nursery. By Gènevieve Tucker, M.D. Pp. xvi + 193. (London: T. Fisher Unwin, 1900.) Price 1*s.*

THIS is one of the many manuals written for the guidance of young mothers. The writer is an American doctor, but suitable to every mother are the clear and practical directions on the management of herself and her infant. The earlier chapters are concerned with heredity and the conditions favourable for the unborn child. The practical advice is valuable, but it is misleading that the author's opinions on questions of heredity are stated as generally acknowledged facts. The chapters on the care of the infant are suggestive and helpful, and the importance of early training in good habits beginning during the first month of life is insisted upon duly and wisely; but the following advice is extraordinary and *not* to be recommended: "Take a good-sized raisin, cut open, taking out the seeds, put it on the umbilicus." A chapter containing a classification of the diatheses of infants (scrofulous, tuberculous types, &c.) seems out of place in a manual of this description. At the end of the book there is a short and emphatic summary of what is and what is not to be done in the nursery; but among the "nursery don'ts" we notice the omission of a warning against a practice too common, at any rate, in this country, namely, the use of so-called baby-soothers.

Interest is added to the book by the introduction of photographs of young children, but we dislike to see advertisements embodied in the text.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Vortex Rings.

IN the course of some experiments preparatory to a lecture on vortex rings, I have introduced certain modifications which may be of interest to teachers and students of science.

The classic vortex-box is too well known to require much description. Our apparatus, which is rather larger than those in common use, is a pine box measuring about a metre each way, with a circular hole 25 cms. in diameter in one end. Two pieces of heavy rubber tubing are stretched diagonally across the opposite or open end, which is then covered with black enamel cloth tacked on rather loosely. The object of the rubber chords is to give the recoil necessary after the expulsion of a ring to prepare the box for a second discharge. Such a box will project air vortices of great power, the slap of the ring against the brick wall of the lecture hall being distinctly audible, resembling the sound of a flip with a towel. An audience can be given a vivid idea of the quasi-rigidity of a fluid in rotation by projecting these invisible rings in rapid succession into the auditorium, the impact of the ring on the face reminding one of a blow with a compact tuft of cotton.

For rendering the rings visible I have found that by far the best results can be obtained by conducting ammonia and hydrochloric acid gases into the box through rubber tubes leading to two flasks in which NH_4OH and HCl are boiling. Photographs of large rings made in this way are reproduced in Fig. 1, the side view being particularly interesting, showing the comet-like tail formed by the stripping off of the outer portions of the

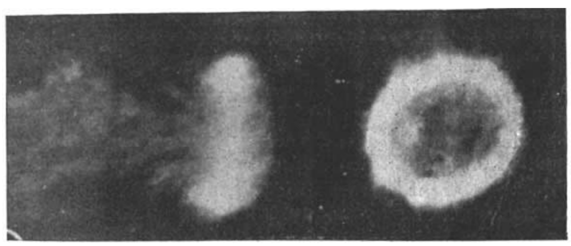

FIG. 1.

ring by atmospheric friction as it moves forward. It is needless to say that the experiment with the visible rings should be left until the end of the lecture. The power of the air-rings can be shown by directing them against a flat pasteboard box, stood on end at some distance from the vortex apparatus, the box being at once overturned or even driven off on to the floor. A large cluster of burning gas jets can be extinguished by the impact of a ring, a modification of which experiment can be shown on a small scale by shooting a capped shell in a shot-gun at a candle several paces off. If one's aim is good the candle will be extinguished by the invisible vortex.

For showing the elasticity of the rings by bouncing one off the other, I find that the best plan is to drive two in rapid succession from the box, the second being projected with a slightly greater velocity than the first, all experiments that I have made with twin boxes having yielded unsatisfactory results.

Though the large vortices obtained with an apparatus of this description are most suitable for lecture purposes, I find that much more beautiful and symmetrical rings can be made with tobacco smoke blown from a paper or glass tube about 2·5 cms. in diameter. It is necessary to practice a little to learn just the nature and strength of the most suitable puff. Rings blown in this way in still air near a lamp or in full sunlight, when viewed laterally, show the spiral stream lines in a most beautiful manner. I have succeeded in photographing one of these rings in the following way. An instantaneous drop shutter was fitted to the door of a dark room, and an arc-lamp focussed on its aperture by means of a large concave mirror. The shutter was a simple affair, merely an aluminium slide operated with an elastic band, giving an exposure of 1/300 of a second. A photo-

graphic plate was set on edge in the dark room in such a position that it would be illuminated by the divergent beam coming from the image of the arc when the shutter was opened. A ruby lamp was placed in front of the plate, and rings were then blown from a tube in front of the sensitive film. As soon as a good ring, symmetrical in form and not moving too fast, was seen to be in front of the plate, a string leading to the shutter was pulled and the plate illuminated with a dazzling flash. The ring casts a perfectly sharp shadow owing to the small size and distance of the source of light; the resulting picture is reproduced in Fig. 2. The ring is seen to consist of a layer of smoke and a layer of transparent air, wound up in a spiral of a dozen or more complete turns.

The angular velocity of rotation appears to increase as the core of the ring is approached, the inner portions being screened from friction, if we may use the term, by the rotating layers surrounding them. This can be very nicely shown by differenti-

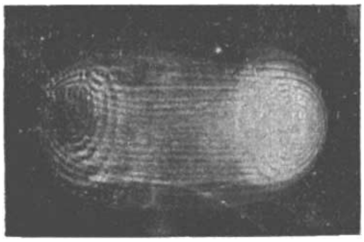

FIG. 2.

ating the core, forming an air ring with a smoke core. If we make a small vortex box with a hole, say 2 cms. in diameter, fill it with smoke and push very gently against the diaphragm, a fat ring emerges which rotates in a very lazy fashion, to all appearances. If, however, we clear the air of smoke, pour in a few drops of ammonia and brush a little strong HCl around the lower part of the aperture, the smoke forms in a thin layer around the under side of the hole. Giving the same gentle push on the diaphragm, we find that the smoke goes to the core, the rest of the ring being invisible, the visible part of the vortex

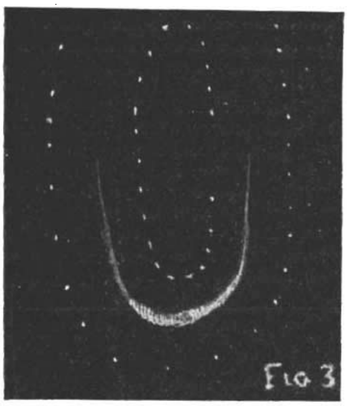

FIG. 3.

spinning with a surprisingly high velocity. Considerable knack is required to form these thin crescent-like vortices, the best results being usually attained after quite a number of attempts have been made. A drawing of one of these smoke-cores is shown in Fig. 3. The actual size of the vortex being indicated by dotted lines, it is instructive as showing that the air which grazes the edge of the aperture goes to the core of the ring. The experiment does not work very well on a large scale, though I have had some success by volatilising sal ammoniac around the upper edge of the aperture by means of a zig-zag iron wire heated by a current.

By taking proper precautions we can locate the smoke elsewhere, forming a perfect half-ring, as is shown in Fig. 4, illustrating in a striking manner that the existence of the ring depends in no way on the presence of the smoke. The best way to form these half-rings is to breathe smoke very gently into a paper tube, allowing it to flow along the bottom, until the end is reached, when a ring is expelled by a gentle puff. A large test tube with a hole blown in the bottom is perhaps preferable, since the condition of things inside can be watched. It is easy enough to get a ring with most of the smoke in the lower half, but to get a ring, one half of which is wholly invisible, the

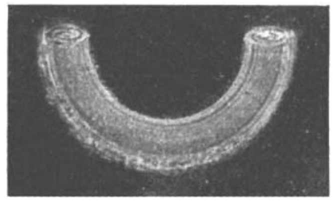

FIG. 4.

smoke ending abruptly at a sharply defined edge, as shown in the illustration, requires a good deal of practice. I have tried fully half-a-dozen different schemes for getting these half-rings on a large scale, but no one of them gave results worth mentioning. The hot wire with the sal ammoniac seemed to be the most promising method, but I was unable to get the sharp cut edge which is the most striking feature of the small rings blown from a tube.

In accounting for the formation of vortex rings, the rotary motion is often ascribed to friction between the issuing air-jet and the edge of the aperture. It is, however, friction with the

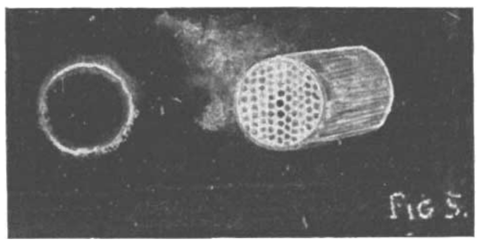

FIG. 5.

exterior air that is for the most part responsible for the vortices. To illustrate this point I have devised a vortex box in which friction with the edge of the aperture is eliminated, or rather compensated, by making it equal over the entire cross-section of the issuing jet.

The bottom of a cylindrical tin box is drilled with some 200 small holes, each about 1·7 mm. in diameter. If the box be filled with smoke and a sharp puff of air delivered at the open end, a beautiful vortex ring will be thrown off from the cullender surface (Fig. 5). We may even cover the end of a paper tube

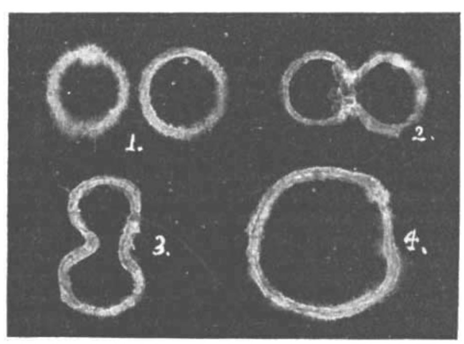

FIG. 6.

with a piece of linen cloth, tightly stretched, and blow smoke rings with it.

In experimenting with a box provided with two circular apertures I have observed the fusion of two rings moving side by side into a single large ring. If the rings have a high velocity of rotation they will bounce apart, but if they are sluggish they

will unite. At the moment of union the form of the vortex is very unstable, being an extreme case of the vibrating elliptical ring. It at once springs from a horizontal dumb-bell into a vertical dumb-bell, so rapidly that the eye can scarcely follow the change, and then slowly oscillates into the circular form as shown in Fig. 6. This same phenomenon can be shown with two paper tubes held in opposite corners of the mouth and nearly parallel to each other. The air in the room must be as still as possible in either case. R. W. WOOD.

University of Wisconsin, Madison.

Dust-tight Cases for Museums.

THE new geological museum now being erected here will have high windows and a long south aspect. The effect of this will be that the sun will fall suddenly on glazed cases and as suddenly pass off them, thus by the expansion and contraction of the air causing dust-carrying currents to force themselves through every chink. From this cause it costs about three times as much to keep cases and specimens clean on the side exposed to the sun as it does in the shaded part of a museum. This may be obviated by elastic diaphragms (which would hardly allow sufficient movement for such large cases as ours) or by small sliding shutters packed with cotton-wool something like Tyndall's respirators.

Can any of your readers refer us to museums in which such a system has been tried, or give us any advice on the subject before our cases have been built? T. MCKENNY HUGHES.

Woodwardian Museum, Cambridge, February 19.

Audibility of the Sound of Firing on February 1.

SIR W. J. HERSCHEL'S letter is very interesting, and I should like to make a few remarks upon it. To begin with, it must, I think, be granted that the discharge of the guns was almost simultaneous. The special correspondent of the *Times* on board the *Majestic* says, "and then simultaneously all the vessels in the long lines joined in, like the tolling of the passing bell." And the special correspondent of the *Times* at Osborne says: "A minute's interval . . . again the quick red flashes down the line, and again the dilatory roar." But why do we find the full minute's interval at Eastbourne, and three reverberations a minute at Oxford? Assuming that there was no firing at Windsor, the reason, I think, must be sought for in the very different character of the roads the sound had to travel over to reach these respective places. In our case the road was all over the sea with the exception of a few miles of low-lying land at Selsey Bill. On the other hand, to reach Oxford the sound would be greatly impeded by the contour of the land, to say nothing of some possible echo from the high ground of the Isle of Wight. Independently of Sir W. J. Herschel's letter, I have grounds for thinking that the sound followed the course of the valleys, and it is possible that the separate reports per minute emerged by as many different channels of passage and of echo. To have received the sound in a straight line, that is to say, to have been high enough to have seen the ships at Spithead, one would have had to have been at an elevation of somewhere about 2800 feet at Eastbourne and 3200 feet at Oxford.

Eastbourne. H. D. G.

Influence of Physical Agents on Bacteria.

IN your report of Dr. Allan Macfadyen's lecture on the influence of physical agents on bacteria (p. 359), I should like to call attention to one point. Dr. Macfadyen suggests that since phosphorescent bacteria regain their power of emitting light after being cooled to the temperature of liquid hydrogen, it may be the case that life is not dependent for its existence on chemical reactions. Because, says he, at the temperature of liquid hydrogen, *e.g.* $-250°$ C., all chemical reactions are well-nigh, if not absolutely, at a standstill, if life were dependent on chemical reactions for its continuance, at that low temperature life would be destroyed. I would submit that this is a case of *non sequitur*. It appears exceedingly probable that the action of excessive cold in *suspending* and stopping vital phenomena, while not *destroying* the capacity of organisms to resume their vital activities, supports the prevalent view that life is dependent on chemical processes. For may it not be that excessive cold, while preventing the vital processes from taking place, by no means alters the chemical constitution of the complicated molecules, the interactions of which normally produce vital phenomena, and leave these molecules, which one may call biogens or anything else, in exactly the same state as they were immediately before the onset of excessive cold, ready as soon as the conditions become suitable once more to resume those vital processes which are known as metabolism.

As an illustration of what I mean I will quote a case of inorganic phosphorescence. It is well known that phosphorus is slowly oxidised in air and emits light at the same time. This reaction takes place when the air is at the pressure of the atmosphere, and the partial pressure of the oxygen is one-fifth of an atmosphere. If, now, the pressure of the air be made equal to five atmospheres, or if the air be replaced by pure oxygen at a pressure of one atmosphere, in both of which cases the pressure of oxygen is five times as great as before, the oxidation ceases and the phosphorescence vanishes. But this is only because the conditions are unsuitable, the constitution of the phosphorus and the oxygen is unaltered, and as soon as the pressure of the oxygen is lowered the phosphorescence begins once more. In both cases, the bacteria and the phosphorus, the action of the physical agent—in the one case cold, in the other pressure—is merely to render the conditions unsuitable for the appearance of the phenomenon, and not to destroy the possibility of its subsequent revival. H. D. D.

Balliol College, Oxford, February 10.

Malaria and Mosquitoes.

I WAS stationed in Karachi, Sind, for more than twenty years. There was undoubtedly a strong belief with the Indians that the disturbance of ground for building led to fever; building operations may be estimated by the fact that I went to a city of 45,000 inhabitants and left 130,000. Not long before I left, the ground of the native town was disturbed by the installation for the first time of a system of underground drainage. I think, but am not sure, this was followed by an outbreak of fever.

Qua mosquitoes, may there not be a distinction between malarious and ordinary fever. F. C. CONSTABLE.

Wick Court, near Bristol, February 24.

Snow Crystals.

AFTER the recent heavy snow in this district, the slight fall yesterday afternoon did not, at first, attract much attention, appearing like sleet to the casual observer. It proved, however, to be of an unusual character, consisting chiefly of beautifully-formed single crystals. It was remarked that "it was snowing stars;" and the ground became covered with myriads of them, varying in size, some being a quarter of an inch in diameter. These "frost flowers" appear to have been common enough in Tyndall's Alpine experiences, but are, I imagine, rarely seen in England upon this scale. The thermometer registered 30° Fahr., and it would be interesting to know if this phenomenon was peculiar to the High Peak district, and what are the conditions conducing to such a display. WM. GEE.

Buxton, February 19.

A "NEW STAR" IN PERSEUS.

WE have received the following:—*Edinburgh Circular*, No. 54. A new star was discovered in Perseus, by Dr. T. D. Anderson of this city, on February 21, 14h. 40m. G.M.T. The star was then of the 2·7 magnitude, and shone with a bluish-white light. Dr. Anderson gave as its approximate place for 1901·0:—

R.A. 3h. 24m. 25s. Decl. + 43° 34′.

At 6h. 58m. G.M.T., on the 22nd, the undersigned estimated the Nova as 0·3 magnitude brighter than α Tauri, and at 8h. 10m. considered it equal to Procyon, which it closely resembled in colour.

On the 23rd, at 8h. 10m. G.M.T., Dr. Halm and Mr. Clark found the new star 0·2 magnitude brighter than Capella.

A direct-vision prism on the 6-inch refractor showed nothing beyond a perfectly continuous spectrum. With the large Cooke spectroscope on the 15-inch equatorial the first impression was the same as with the smaller